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Individual Differences in Eyewitness Identification Accuracy between
Sequential and Simultaneous Line-ups: Consequences for Police Practice and
Jury Decisions

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Individual Differences in Eyewitness Identification Accuracy between Sequential and Simultaneous
Line-ups: Consequences for Police Practice and Jury Decisions

STRUCTURED ABSTRACT

Background- Although previous research indicated sequential line-up procedures result in fewer mistaken identifications, findings revealed this is at the expense of accurate identifications more typical within simultaneous procedures. As such, a lack of agreement remains surrounding which procedure is superior, and the interaction such procedures have upon eyewitness confidence. The interaction witness demographics have upon identification accuracy also remains unclear.

Participants and Procedure- The opportunistic sample, consisting of 60 people from the general population, was divided randomly into two experimental conditions; Simultaneous (SIM) and Sequential (SEQ). Participants in the *sequential* procedure observed 12 photographs, one at a time, deciding if they believed the suspect to be the person shown in the current photograph and unable to return to a given picture once they decided the individual shown was not the suspect described. Participants in the *simultaneous* condition were shown all 12 photographs concurrently and asked to determine which, if any, of the photographs was the suspect described.

Results- Findings displayed no significant differences in identification accuracy between line-up procedures, however significant differences in confidence levels between the two line-up procedures were found. Additionally, analysis of demographic features showed previous line-up experience to be significantly associated with identification accuracy.

Conclusions- The present research provides new insight into the interaction of eyewitness confidence between line-up techniques offering an alternative explanation of witness confidence as well as procedural fairness. Evidence of practice effects increasing the accuracy of identifications provides beneficial future implications for police line-up procedures and safer jury decisions, often reliant upon identification evidence.

Keywords; *sequential-superiority effect, mock witness paradigm, confidence-accuracy relationship*

INTRODUCTION

Eyewitness testimony has long played an integral role in the apprehension and conviction of offenders (Wells & Olson, 2003). One common type of evidence witnesses may offer police in the aftermath of a crime is a positive identification of a suspected perpetrator from a line-up. In spite of advancements in police technologies and widespread implementation of surveillance cameras throughout British towns and cities, modern day policing remains reliant upon eyewitness identifications, with recollections typically forming a major piece of evidence against those accused. Studies have repeatedly displayed the powerful influence that eyewitness identifications have upon jury decisions of guilt during trial (Cutler, Penrod & Dexter, 1990), which is elevated further by witness confidence (Semmler, Brewer & Douglas, 2011), with jurors considering eyewitness identifications to be a highly reliable form of evidence (Brigham & Bothwell, 1983). However, over recent years, a growing body of research and appeal case exonerations have begun to amass, raising important questions surrounding the reliability ascribed to witness identification evidence in court.

Scheck, Neufeld and Dwyer (2000), and Wells, Memon and Penrod (2006) independently examining sentencing exonerations in the United States (US), displayed in more than 75% of cases, inaccurate identifications were the key component leading to the wrongful incarceration of innocent suspects. The Devlin Report, commissioned by the British government years earlier investigating the impact of witness evidence upon miscarriages of justice in the United Kingdom (UK), also concluded that mistaken eyewitness identifications were the single biggest factor preceding wrongful convictions (Devlin, 1976). As DNA evidence advanced and became routinely included within criminal cases during the 1990's, doubts surrounding the reliability of eyewitness identifications were corroborated, providing concrete scientific evidence that innocent people had been wrongly convicted of crimes they did not commit (Wells, Small, Penrod, Malpass, Fulero & Brimacombe, 1998). However, recent figures reported by the Innocence Project (2015), set up to

assist with the multitude of DNA exoneration cases emerging, reveal that many innocent people likely remain incarcerated today, with eyewitness misidentifications reported to account for 70% of all confirmed wrongful convictions to date in the US. Whilst similar statistics are not reliably recorded the world over, such findings undoubtedly highlight the degree of credibility that continues to be ascribed to eyewitness identification evidence, despite demonstrations of how vulnerable such witness testimony can be.

Research attempts to provide greater understanding around how eyewitness misidentifications occur have identified a multitude of perceptual and memory fallibilities underlying such identification errors. Some factors have been shown to be related to individual differences in characteristics of the eyewitnesses themselves, including demographic estimators, and the perceived confidence of witnesses in their identifications (Cutler et al., 1990; Meissner & Brigham, 2001; Semmler et al., 2011; Wells & Bradfield, 1999; Wright & Stroud, 2002; Yarmey, 1993). However, predominately, research findings and debate have centred upon the police line-up procedure itself, with differences between procedural techniques found to elicit varying levels of accurate identifications and, more importantly, lower rates of false identifications (Brewer & Wells, 2006; Lindsay & Bellinger, 1999; Malpass, Tredoux & McQuiston-Surrett, 2009; Wells, Stebley & Dysart, 2015; Wixted, Mickes, Dunn, Clark & Wells, 2016).

Line-up Procedures

Simultaneous Line-ups

Defined by Wells and Olson (2003), police line-ups are considered to be an evidential procedure, whereby a suspected perpetrator of a crime is presented to eyewitnesses among other non-suspect *filler* individuals, with the aim of determining whether the suspect (termed *target* individual) can be identified as the culprit responsible. Traditionally police line-ups in the UK and US involved the

live simultaneous presentation of a target individual alongside multiple filler individuals similar in appearance to the suspect accused (Wogalter, Malpass & McQuiston, 2004). While live line-ups have largely been replaced by the more typical photo line-ups, the simultaneous ‘all-at-once’ presentation of line-up members has itself come under scrutiny. Moreover, upon being shown an array of line-up photographs simultaneously, eyewitnesses are asked to decide whether the culprit witnessed committing the crime is present. Research has shown that when asked to make identifications in this format, eyewitnesses tend to make *relative* judgements surrounding which member of the line-up looks most like the culprit witnessed (Lindsay & Wells, 1985; Wells, 1984, 2006). However, criticism has arisen surrounding use of such a procedure that results in one member of the line-up always more closely resembling the actual offender witnessed than other individuals present, whether the actual culprit is present or not.

Research has suggested simultaneous procedures may themselves account for false identification errors, with study findings displaying that although this type of line-up appears to increase accurate identifications when the culprit is present in the line-up, the procedure is in fact significantly more likely to lead to mistaken identifications when the culprit is not present (Steblay, Dysart, Fulero & Lindsay, 2001; Wells, 1993). Undertaking target absent line-up experiments where eyewitnesses were shown a simultaneous photo array without the perpetrator present, led researchers to conclude simultaneous procedures to be unfairly biased towards police suspects in that, irrespective of guilt, the more closely an individual resembles the witnessed perpetrator in comparison to other line-up members, the more likely they are to be identified as the culprit responsible (Lindsay and Bellinger, 1999; Kneller, Memon & Stevenage, 2001; Dysart & Lindsay, 2001). Furthermore, this outcome becomes more prevalent where witness memory is imperfect or incomplete (McQuiston-Surrett, Malpass & Tredoux, 2006).

Sequential Line-ups

Attempting to improve upon such procedural limitations associated with relative judgement identifications, an alternative technique was devised, aiming instead to encourage *absolute* judgements. Central to Lindsay and Wells (1985) sequential line-up procedure is that witnesses view line-up members 'one-at-a-time' being required to make a decision upon each individual, prior to moving on to another and unable to return to those members previously rejected. Eyewitnesses also remain unaware of the number of individuals present in the line-up in an attempt to further encourage an absolute judgment process deemed necessary for improving accuracy of identifications (Lindsay, Lea & Fulford, 1991). Numerous empirical studies have sought to examine the effects of sequential versus simultaneous line-ups upon identification accuracy, with results predominately supporting the notion of a sequential superiority effect (Lindsay & Wells, 1985; Melara, DeWitt-Rickards & O'Brien, 1989; Wells, Steblay & Dysart, 2015). In a carefully devised comparative study examining the two differing procedures, Cutler and Penrod (1988) reported finding that the sequential procedure significantly reduced false identifications and increased correct rejections of line-ups, when the culprit was not present (*target-absent* conditions). In a major meta-analytic review of the opposing line-up procedures, Steblay et al. (2001) examined 23 studies, which compared the techniques across over four thousand experimental participants, and concluded that although the simultaneous procedure obtained significantly more correct identifications overall, the sequential procedure elicited significantly fewer mistaken identifications for both target-present and target-absent line-ups. In fact, when psychologists considered experts in the field were surveyed about how reliable they deemed the sequential presentation format to be in eliciting accurate identification evidence, findings revealed over 80% believed the superiority of the sequential line-up to be reliable enough to be used as evidence in court (Kassin, Tubb, Hosch & Memon, 2001). The implications of such findings are undoubtedly evident in the wide ranging uptake of the procedure within Western legal systems, with recent figures revealing 32% of law enforcement agencies in the US now use the line-up type (Police Executive Research Forum, 2013).

New Jersey, North Carolina and Illinois have adopted the procedure as the gold standard line-up technique throughout the entire states and across all policing agencies (Carlson, Gronlund & Clark, 2008).

Despite wide ranging empirical support and practical implementation of the procedure, research has recently begun to identify potential limitations of sequential line-ups. Criticism has centred upon the apparent trade-off between fewer mistaken identifications at the expense of accurate identifications. Meta-analytic results have generally shown that, while the procedure elicits fewer misidentifications when a perpetrator is not present in a line-up, fewer accurate identifications are also made when the perpetrator is present in the line-up, resulting in missed opportunities to identify culprit's responsible (see Steblay, Dysart & Wells, 2011). Wells et al. (2015) also found that, when examining procedural difference effects upon real witnesses of crime randomly assigned to either simultaneous or sequential techniques across four policing districts, previously acknowledged benefits of sequential procedures were not significantly different from simultaneous procedures in that, rates of mistaken identifications remained highly similar between the two line-up types. Similar findings led Malpass et al. (2009) to question whether the uptake of sequential procedures were more explicable as a wholesale promotion technique, deriving from supportive research largely conducted by the pioneers of the procedure, than being resultant of a strong empirical grounding. Ebbesen and Flowe (2002) account for the supposed sequential superiority effect as merely the result of the more cautious nature of witnesses undertaking this type of line-up, which as a result of making fewer choices in general from target-present and target-absent line-ups, make fewer false identifications overall. In line with such a viewpoint Meissner, Tredoux, Parker and MacLin's (2005) research identified similar decreases both in correct and false identifications for sequential line-ups when compared to simultaneous line-ups. This led the authors to conclude that despite a conservative change in response criterion, little change has correspondingly occurred in identification accuracy, suggesting differences observed are the result of a generally reduced witness willingness to make a selection. Although, arguably, a reduced willingness to make a

selection not wholly founded in a strong memory trace of the perpetrators identity may be a desirable outcome in order to reduce false identifications, where the procedural construction of line-ups are shown to intrinsically discourage identifications overall the sequential superiority effects are likely to be brought into question. A result of such criticisms and lack of agreement within the research has led many scholars to conclude that debate surrounding the negative or superiority effects of any one procedure (termed *system variables* – Wells, 1978) remains to be conclusively displayed. Further research exploration is undoubtedly required in order to better understand and justify use of any one approach. A position more apparent when considering the rapid and increasing uptake of sequential line-up procedures throughout Western justice systems (Police Executive Research Forum, 2013).

Eyewitness Confidence

While debate rages on surrounding whether variants of line-up procedures provide superior identifications, literature has amassed around the relationship between eyewitness confidence and identification accuracy. The appealing nature of a confident eyewitness has been consistently displayed to influence both the general public's belief in events that a witness described (Brigham & Bothwell, 1983; Deffenbacher & Loftus, 1982), and juror beliefs surrounding the accuracy of such testimony (Bradfield & Wells, 2000; Lindsay, Wells & O'Connor, 1989; Semmler et al., 2011). In fact, research has provided strong evidence to display that eyewitness confidence in identifications may in fact be the greatest predictor of verdict outcomes at trial (Cutler et al., 1990), with reliance upon witness confidence shown to be unaffected by tradition safeguards, such as cross-examination (Penrod & Cutler, 1995). Within the United States, the Supreme Court held that the confidence of eyewitness testimony can be used as a measure of its reliability, alongside determining whether such evidence can be considered admissible during trial (see Dobolyi & Dodson, 2013).

In spite of such apparent unwavering dependence upon eyewitness confidence, traditionally the results of mock crime studies found little evidence of a relationship between witness confidence and identification accuracy (Bothwell, Deffenbacher & Brigham, 1987; Wells & Murray, 1984; Wells & Olson, 2003). However, research contradicting these findings has begun to take precedence, instead accounting for the lack of any significant relationship as resulting from the complex interaction of confidence as a function of other factors. Similarity of mistakenly identified individuals to the actual perpetrator responsible, strength of the initial memory trace and distinctions between those who choose to make an identification versus those who did not, have all been found to negate non-significant confidence-accuracy findings (Deffenbacher, 1980; Lindsay, 1986; Sporer, Penrod, Read & Cutler, 1995). Recent research also obtained evidence that, when examining the relationship between confidence and identification accuracy in genuine police line-up situations, confidence becomes a highly significant and reliable indicator of correct identifications (Wixted et al., 2016).

Attempts to develop the confidence-accuracy relationship further have recently begun questioning whether differences may exist in witness confidence ratings for identifications made between simultaneous and sequential line-up procedures. Theorising behind such a notion stems from the assumption that stricter absolute judgement criterion associated with sequential line-up identifications demands greater use of quality memory information and, therefore, where identifications are made, they are likely to be indicative of confident decision process (Wells & Olson, 2003). Fundamentally, the belief is that when sequential line-up identifications are made, they are likely to be made more confidently because of the additional caution associated with decisions made against one individual at a time. One recent study which set out to directly test this assumption found evidence corroborating such an effect whereby, consistent with previous research, the sequential procedure did produce less mistaken identifications than the simultaneous procedure, however, it also produced higher confidence in identifications, even where such selections were inaccurate (Dobolyi & Dodson, 2013). Although contemporary findings generally display evidence in favour of a relationship between eyewitness confidence and identification

accuracy, further research is undoubtedly required to examine the complexities of such a relationship and re-examine Dobolyi and Dodson's (2013) recent results. An alternative assertion that appears intuitively appealing to that made by the aforementioned authors, may be that confidence in identifications is in fact greater within simultaneous line-ups resulting from eyewitnesses making relative judgements and thereby being required to apply comparative logical assessment of each line-up member rather than an abstract identification made sequentially. What is certain however, is the need for greater understanding through research exploration, as real world evidence and cases (see Garrett, 2011) continue to display the damaging consequences associated with fallibilities in eyewitness identifications.

Individual Differences in Identification Accuracy

The relationship between eyewitness characteristics and identification performance has historically appeared complex and inconsistent. Termed *estimator variables* (Wells, 1978), the effects of eyewitness demographics have produced mixed findings surrounding the influence of such factors upon identification accuracy. Early explorations provided some support that females were more likely to make accurate identifications than males, alongside displaying a slightly greater propensity to make a culprit selection generally, in itself appearing to correspond with increased levels of misidentifications (Shapiro & Penrod, 1986). However, overall findings commonly display no significant gender differences in line-up accuracy (Wells & Olson, 2003). Perhaps somewhat surprisingly, research to date has also failed to report any relationship between eyewitness intelligence or occupation upon identification performance (see Brown, Deffenbacher & Sturgill, 1977). One factor that has however obtained some support of being an important determinant of identification accuracy is witness age. Studies have consistently shown that young children and the elderly perform significantly worse than young adults overall, although this appears to be moderated by the presence of the culprit. Moreover, Pozzulo and Lindsay (1998) display that within

target present line-ups, identification accuracy is similar to that of young adults, however, when targets are absent from line-ups, mistaken identifications are committed at significantly higher rates than with younger adults. Research also suggests witness age relative to the age of the culprit, correlates with accuracy levels, in that eyewitnesses are better able to identify culprits of a similar age to themselves in target-present line-ups than individuals of a differing age group (Wright & Stroud, 2002; Yarmey, 1993). Complicating this relationship, further recent findings show that when controlling for variations in line up types (e.g. Simultaneous vs Sequential), older eyewitnesses are consistently worse than younger witnesses at both accurately identifying culprits from target-present line-ups, alongside accurately rejecting culprits within target-absent line-ups (Erickson, Lampinen & Moore, 2016). Nonetheless, findings display age does have important implications upon identification accuracy, although with few direct examinations evident within the literature, further research is required to better understand the potential interaction between age and differing line-up types (e.g. simultaneous and sequential). Interestingly, although a body of research has begun to develop displaying the increase in identification accuracy of police officers with experience (see; Wells et al., 2006), to the authors' knowledge, no research exists examining the potential beneficial effects of previous line-up experience upon eyewitness identification performance. Further exploration surrounding the range of demographic estimators discussed upon eyewitness performance are thereby required, in order to examine whether such individual differences may have any significant impact upon identification accuracy.

The Current Study

Wrongful conviction DNA exonerations and research examinations to date have shown eyewitness identifications to exert a powerful influence upon trial outcomes. Whilst previous research has indicated sequential line-up procedures result in fewer mistaken identifications, findings have displayed this to be at the expense of accurate identifications more typical within simultaneous

procedures. Yet, in spite of wide ranging uptake of sequential procedures throughout western law enforcement agencies, a lack of agreement remains surrounding the supposed superiority effect of any one line-up technique, and the interaction such procedures may have upon eyewitness confidence. Full understanding around the interaction eyewitness demographics have upon identification accuracy also remains unclear. Therefore, the main objective of the current study is to examine whether significant differences occur between sequential and simultaneous line-up procedures when the component of memory is removed. Previous research has successfully adopted Doob and Kirshenbaum's (1973) *mock witness paradigm* (explained in more depth in the method section) in order to explore aspects of line-up procedural fairness (Tredoux, 1999; Valentine & Heaton, 1999). However, little research has applied such a paradigm upon a genuine criminal event utilising the actual array of line-up photographs shown to the eyewitnesses during the original police investigation. It is hypothesised that, upon removing the memory component from witness line-ups, the sequential line-up procedure will be significantly more likely to lead to identification accuracy overall than the simultaneous line-up procedure, where a superiority effect exists. In addition, based upon recent research findings it is predicted that sequential line-up procedures will display significantly greater eyewitness confidence surrounding identifications than the simultaneous line-up procedure and that there will be a significant relationship between confidence and identification accuracy. Finally, demographic features and previous line-up experience will be tested to examine any significant relationship with identification accuracy.

PARTICIPANTS AND PROCEDURE

Participants.

The study adopted an independent measures design and utilised an opportunistic sample of 60 people from the general population (males $n = 30$, females $n = 30$), ranging in age from 18 – 62 years old ($M = 32.15$, $SD = 12.99$), and varying widely in occupation and educational background.

Participants were recruited through use of advertising posters distributed throughout a city centre in the midlands of England, with all those who responded being re-contacted to arrange participation. Participants were randomly assigned to experimental conditions: a Simultaneous condition (SIM) and a Sequential condition (SEQ), upon arriving on the day. No individuals or particular groups of people were excluded from participating, only taking note of participant's experiencing possibly confounding factors, including known memory or information processing defects, or serious eye sight problems to ensure such factors did not impact experimental results. However, no such conditions were known to be present within any of those who responded or took part.

Procedure.

The study adopted use of the Doob and Kirshenbaum's (1973) *mock witness paradigm*, whereby participants who have not previously seen the offender in question, but have simply been given information about the culprit, are tested. Upon arrival participants were taken individually to a room located on the university campus which had been set up to loosely resemble a police station interview room in that it contained just a desk, recording device and two chairs. Participants were then informed that they would be required to view a series of photographs, which constituted the police line-up procedure to a crime that they would shortly be informed about. A brief standardised description of the culprit convicted of the offence was then given to participants based upon a description given by a witness at the time alongside a more detailed account of the crime that the perpetrator had carried out. Participants in the *sequential* line-up condition were informed that they would observe 12 photographs, one at a time, and could observe all photographs twice before being asked to make a decision on each picture in turn, surrounding whether they believe the suspect to be the person shown in the current photograph. In line with current UK and US sequential police line-up procedures, participants were informed that they could not go back to a given picture once they had decided the individual shown was not the suspect described. Participants in the *simultaneous* line-up condition were shown all 12 photographs at once and asked to make a decision surrounding

which, if any, of the photographs they believed to be suspect. All subjects were informed that they could take as much time as they liked to view photographs before selecting which picture they believed to be the individual convicted of the crime described to them. Mock witnesses had not previously seen the offender in question, but were simply given standardised information about the culprit and the terrorist attack used in the experimental conditions, in line with the mock witness paradigm. This standardised information was detailed to participants prior to observing line-up photographs within the varying experimental conditions. The purpose of using the mock witness paradigm was to remove the memory trace component from the experimental conditions, in order to test whether any aspect of the line-up construction itself would influence witness identifications. After making an identification, participants were immediately asked to rate how confident they were in the accuracy of their selection on a five point Likert scale, whereby one represents 'very unconfident' and five, 'very confident'. Participants were immediately asked for such confidence ratings, as a means of ensuring any post-selection feedback or experimenter interaction did not influence such ratings. Similarly, experimenters themselves were blind from knowing which photo from the array of line-up pictures was the target-culprit, as a further control measure to reduce any experimenter bias effects. Some controls were undertaken in an attempt to ensure any differences observed in the results could be attributed to differences between the experimental conditions including, standardising the instructions given to participants for each of the conditions, and minimising use of any corroborate feedback language given to participants throughout experimentation and after line-up identifications have been made. All British Psychological Society (2014) ethical guidelines were adhered to throughout the duration of the research, alongside conforming to the provisions of the Declaration of Helsinki, applicable when researching with human subjects (World Medical Association, 2013).

Materials.

Two sets of the same 12 photo array of line-up pictures, containing the *target* individual convicted for a high profile terror attack that took place in the UK during the 1980's alongside eleven other *filler* individuals, were shown to participants. These were presented on one sheet of A4 paper for the simultaneous condition, and presented as 12 individual photos for the sequential condition. Photographs were the same as those pictures used in the real line-up procedure, which eyewitnesses to the aforementioned terrorist attack were shown, in order to assess the reliability of such photos between the differing line-up procedures. A Dictaphone handset and desktop computer were used to record and transcribe participant selections within experimental conditions. Participant response forms were also employed to record participant age, level of education, occupation, any previous experience of police line-ups, culprit selections, and corresponding confidence ratings.

Analysis.

Frequencies, descriptive statistics, and Pearson chi-square tests for independence were calculated using SPSS 22. Pearson chi-square tests for independence, as the recommended method for exploring relationships between two categorical variables, were applied in order to explore the associations between: line-up procedure (simultaneous or sequential) and identification accuracy, line-up procedure and confidence level, and participant demographics and identification accuracy.

RESULTS

Demographic profile and descriptive statistics

A demographic profile of participants, as well as descriptive statistics, are presented in Table 1. Most participants have an above university degree level of education (60.0%), are employed (60.0%), and do not have prior experience of real line-ups (75.0%).

Insert Table 1 here

Chi-square test of association

Chi-square tests for association were conducted to help determine if there were significant relationships between: identification accuracy and line-up type; confidence level and line-up condition; and identification accuracy and remaining demographic variables.

There was no significant association between the type of line-up procedure undertaken and identification accuracy for either simultaneous or sequential line ups, $\chi^2 (1, N = 60) = 2.07, p > .05$. The observed frequencies in both simultaneous and sequential line-up accuracy scores were, therefore, not significantly different from the frequencies that could be expected in the differing line up conditions by chance (Field, 2009) see Table 2 below.

Insert Table 2 here

Results reveal a statistically significant difference in confidence level between simultaneous and sequential line-up conditions. The association between these variables was significant and strong, $\chi^2 (3, N = 60) = 24.00, p < .001$, Cramer's $V = .63$. Among participants in the simultaneous condition, less were very unconfident and more were confident with their decision than would be expected. Conversely, there were more participants in the sequential condition that were very unconfident and less that were confident than would be expected (see Table 3). Results show no statistically significant difference in identification accuracy between levels of confidence, $\chi^2 (3, N = 60) = 4.83, p = .19$. These results suggest that the rate of identification accuracy is similar for participants that were very unconfident, unconfident, neither confident or unconfident, and confident.

Insert Table 3 here

Further tests of association were also conducted on participant demographics and identification accuracy to investigate whether any estimator variables frequencies differed significantly in identification accuracy.

Findings show no statistically significant differences in identification accuracy between age groups, $\chi^2 (4, N = 60) = 2.73, p = .60$. These results suggest that the rate of identification accuracy is similar for participants in the 18-25, 26-35, 36-45, 46-59, and 60+ age groups.

Chi-square results revealed no statistically significant differences in identification accuracy between males and females, $\chi^2 (1, N = 60) = 2.07, p = .15$. These results indicate that the rate of identification accuracy is similar for male and female participants.

The test of association results indicate that identification accuracy does not appear to be statistically associated with level of education. There were no statistically significant differences in identification accuracy between those with an education below degree level and those above degree level, $\chi^2 (1, N = 60) = .09, p = .77$, suggesting that the rate of identification accuracy is similar for participants below degree level of education and above degree level of education.

Findings indicate that there were no statistically significant differences in identification accuracy between types of occupation, $\chi^2 (3, N = 60) = 1.13, p = .77$, thereby indicating that the rate of identification accuracy is similar for students, unemployed participants, participants that were employed in skilled professions, and participants that were employed in unskilled professions.

The test of association results indicate that identification accuracy is statistically associated with previous line-up experience; the results show a statistically significant difference in identification accuracy between previous line-up experience and no previous line-up experience. The association between these variables was significant and moderate, $\chi^2 (1, N = 60) = 6.21, p < .05$, Cramer's $V = .32$. Among participants who had previous experience of real line-ups, there were more who were accurate than expected (see Table 4).

Insert Table 4 here

DISCUSSION

Adopting the mock witness paradigm, the present study sought to further investigate the relationship between sequential and simultaneous line-up procedures and identification accuracy. Additionally, this study aimed to examine the association between varying line-up types and eyewitness confidence in identifications, as well as assessing any potential relationships between witness demographics and identification accuracy.

Along with the participant response form, photos previously described (see method section) were used to examine the relationships between line-up procedure (simultaneous or sequential) and identification accuracy, line-up procedure and confidence level, and participant demographics and identification accuracy after standardised descriptions of the target culprit were given. Results revealed no significant relationship between the type of line-up procedure undertaken and identification accuracy for either simultaneous or sequential line ups; participants in the sequential line-up condition were no more accurate in their identifications than those in the simultaneous line-up condition. Such findings are consistent with previous literature, which suggested when examining procedural difference effects between simultaneous and sequential techniques, utilising genuine or more realistic line-up procedures to those used within real police identifications, rates of accurate and inaccurate identifications remain similar (Wells et al., 2015; Wixted et al., 2016). Corresponding with Malpass et al. (2009) and Messiner et al. (2005), the present results suggest that when removing the memory component in line with the mock witness paradigm, sequential line-up procedures provide little superior effects upon eyewitness identifications than obtained within traditional simultaneous line-ups. Although the present findings appear to contradict previous research finding evidence of a sequential superiority effect (Lindsay & Wells, 1985; Melara et al., 1989), proponents of the mock witness paradigm, Doob and Kirshenbaum (1973), and Valentine and Heaton (1999), outline that rather than displaying deficiencies in procedural performance, lack

of significant differences between procedures indicate instead that no aspect of either line-ups' construction unfairly influences identifications made. The present findings are therefore important for police practice as they reveal, while the interaction of eyewitness memory may result in varying levels of mistaken identifications, when the memory component is removed procedurally, the underlying construction of sequential and simultaneous line-ups are equally fair.

Present results also revealed significant differences in eyewitness confidence between line-up procedures. Participants making identifications in the simultaneous procedure were significantly more likely to be confident in identifications irrespective of accuracy and, conversely, in the sequential line-up procedure individuals were significantly less likely to be confident in identifications made than anticipated. These findings are in contrast to research by Dobolyi and Dodson (2013) in that, rather than displaying sequential absolute judgments to result in greater witness confidence, witnesses were in fact less likely to be confident in selections made than identifications made using simultaneous relative judgements. One possible explanation may be that, contrasting with what the aforementioned authors suggest, confidence in identifications is established through witnesses being required to comparatively assess each line-up member against one another and form a logical conclusion surrounding the likelihood of being accurate in that selection when matched to their memory of the perpetrator, rather than making a more abstract identification within sequential procedures. While limited research has sought to examine confidence associated with identifications between line-up types in this way, much research has highlighted the complex relationship between confidence and accuracy, with a multitude of mediating factors found to influence such (Lindsay, 1986; Sporer et al., 1995). Therefore, the present findings are important in displaying the need for future research explorations that seek to clarify further the impact of line-up type upon eyewitness confidence rates and the accuracy of such identifications within varying line-up procedures, when controls for possible mediating factors are employed. Extrapolating a more direct causal relationship would provide Courts with the necessary understanding to advise jurors of when caution must be applied to eyewitness identifications,

irrespective of confidence observed. Currently the US Supreme Court deems confidence of eyewitness evidence to be a measure of its reliability (see Dobolyi & Dodson, 2013) and a multitude of research has shown the predictive ability of witness confidence upon jury decisions (Cutler et al., 1990). However, with current findings being in direct opposition to latest research underpinning such legal practice, and ever growing DNA exonerations highlighting the fallibility of jury reliance upon mistake eyewitness identifications (Innocence Project, 2015), further research is required.

Regarding demographic estimators, the present findings obtained no evidence to support an association between identification accuracy and gender, age, occupation or level of education. Whilst results sit in contrast to research that displayed age to be an important determinant upon identification accuracy (Wright & Stroud, 2002; Yarmey, 1993), findings correspond with literature surrounding the remaining estimator variables, largely shown to have little impact upon identification performance (Shapiro & Penrod, 1986; Wells & Olson, 2003). A limitation of the present study surrounds the lack of examination of the relationship between more psychologically grounded constructs and eyewitness identification accuracy. Moreover, although few attempts have been made to link line-up performance to personality characteristics, early studies found those high in the trait of anxiety made fewer mistaken identifications (Shapiro & Penrod, 1986), and high self-monitors, who adapt their behaviour based upon social acceptance needs, displayed greater accuracy in identifications (Hosche & Platz, 1984). Upon also considering recent research displaying the influence that personality traits (empathy, egocentricity) and social identification can have upon offender cognitions and thinking patterns (Boduszek, Dhingra & Debowska, 2016; Sherretts & Willmott, 2016), the need to establish whether similar personality factors may influence eyewitness decision making processors in future research remains.

Interestingly, present findings did indicate identification accuracy to be associated with previous line-up experience. Witnesses with experience of undertaking real line-ups in the past were significantly more accurate in their target selections than those with no previous experience. While

some research has shown police officers' own identification performance improves with experience in the position (Wells & Olson, 2003), to the authors' knowledge research is yet to evaluate the effects of previous line-up experience upon eyewitness performance, neither report evidence supporting the idea that identification accuracy can be improved with experience. While findings provide important contributions to the eyewitness literature, results also offer significant practical implications for police line-up procedures, the suggestion being that pseudo line-up identifications prior to an eyewitness's genuine line-up identification may lead to increased accurate identifications and fewer inaccurate identifications. Boccaccini, Gordon and Brodsky (2004), investigating the impact of witness preparation upon the delivery of testimony at trial, found evidence to be more complete and confidently conveyed following practice attempts. Such findings alongside current results, lead the researchers to suggest that the development of formal guidelines allowing witnesses to receive brief training and practice attempts at line-up identifications, may itself lead to improvements in eyewitness identification accuracy rates. As such, future research should seek to examine more rigorously the beneficial effects of practice upon line-up performance, making distinctions between sequential and simultaneous line-up procedures, as well as monitoring rates of both misidentification and accurate identifications.

Given the significance of the present study findings overall, and novel contributions outlined for police practice and evidential policy, future research should seek to address certain limitations evident within the current research. Alongside acknowledging the need for inclusion of personality assessments, the need to replicate present findings within a more formal policing environment is required. Despite utilising an array of images derived from the genuine police investigation alongside an attempt to simulate the layout of a police interview room, conditions under which participants observed photographs were more akin to laboratory settings than a police station; factors which some research has shown to impact the strength and direction of results (Wixted et al., 2016). Furthermore, participants were not actual witnesses to the crime in which they were asked to make line-up identifications about and based selections wholly upon standardised descriptions

provided to them. Although this is a common technique utilised within eyewitness identification research undoubtedly drawing conclusions around witness identification accuracy from such stimulated conditions requires findings obtained to be interpreted with caution. Thereby, future replications of the present study would benefit from greater ecological validity derived from testing in more realistic policing surroundings and perhaps utilising actual witnesses to crimes identifications are made in respect of. Due to the somewhat exploratory nature of the present aims, the study sample was also relatively small, which although varying widely in terms of demographic factors, future research should seek to improve upon. Replication and development of current findings could have major implications for the police line-up procedures, providing greater insight into the structural fairness and confidence interaction between sequential and simultaneous procedures, alongside possible enhancements in identification accuracy, irrespective of procedures currently in place, through a simple process of permitting eyewitnesses practice attempts. More importantly however, upon considering the mass of research and case exonerations displaying jurors' (over)reliance upon eyewitness identification evidence (Semmler et al., 2011), is the potential for current findings to safeguard against unsafe verdict outcomes in the future. Within the UK, recent research displaying the negative impact that juror attitudes and misconceptions can have upon verdict outcomes, led to the requirement that judges advise jurors against such bias within related cases (Ellison & Munro, 2014). Current findings display, beyond a simple relationship with accuracy, eyewitness confidence in identifications also appears dependent upon the line-up procedure that witnesses are exposed to and may in itself act as a moderating factor. Given the implications of such developed understanding of the confidence-accuracy relationship, and undoubted need for further research, the opportunity to ensure judges and in turn jurors are more reliably informed surrounding the inferences that ought to be made from such confident witnesses, emerges.

CONCLUSIONS

Given the lack of agreement surrounding which line-up procedure is supposedly superior, this study sought to examine variations between differing line-up types. The present research provides evidence displaying the comparable fairness of both line-up procedures when adopting the mock witness paradigm, with no evidence of a sequential-superiority effect upon removing the memory component of identifications. New insight into the interaction of eyewitness confidence between line-up techniques, contrasting with past research findings offers an alternative account of witness confidence whereby, increased confidence appears based upon relative comparative assessments of differing line-up members from which calculated conclusions within simultaneous line-ups are made but reductions in eyewitness confidence levels attained when abstract isolated identifications within sequential procedures are made. Furthermore, evidence of practice effects increasing the accuracy of identifications provides simple yet possibly substantially beneficial future implications for police line-up practice and safer jury decisions when considering the reliance upon identification evidence. Although questions remain surrounding the superiority of sequential-simultaneous line-ups effects, utilisation of the often neglected mock witness paradigm allowed for advancements in understanding surrounding the differing line-up techniques and future research developments to become apparent. Through the continued growth of empirical research set out in this study, the implications upon police practice and safer verdict outcomes will continue to progress and be ensured. Though, the need for continued research in this field is required not only to reduce mistaken eyewitness identifications that result in wrongful convictions, but ensure such occurrences also result in the real perpetrators being brought to justice.

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